National Institute of Environmental Health Sciences

How host population dynamics translate into time-lagged prevalence: An investigation of Sin Nombre virus in deer mice

Author(s): Adler FR, Pearce-Duvet JM, Dearing MD
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Abstract:

Human cases of hantavirus pulmonary syndrome caused by Sin Nombre virus are the endpoint of complex ecological cascade from weather conditions, population dynamics of deer mice, to prevalence of SNV in deer mice. Using population trajectories from the literature and mathematical modeling, we analyze the time lag between deer mouse population peaks and peaks in SNV antibody prevalence in deer mice. Because the virus is not transmitted vertically, rapid population growth can lead initially to reduced prevalence, but the resulting higher population size may later increase contact rates and generate increased prevalence. Incorporating these factors, the predicted time lag ranges from 0 to 18 months, and takes on larger values when host population size varies with a longer period or higher amplitude, when mean prevalence is low and when transmission is frequency-dependent. Population size variation due to variation in birth rates rather than death rates also increases the lag. Predicting future human outbreaks of hantavirus pulmonary syndrome may require taking these effects into account.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Zoonotic Disease

Zoonotic Disease: Hantavirus Pulmonary Syndrome

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Short-Term (

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content